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ABSTRACT

This report is based on a questionnaire sent to 32 selected National Archives and on interviews with archivists from eight countries. Geared to the needs of developing countries, the report covers: (1) the impact of computerization on finding aids; (2) advantages and problems of computerization, including enhanced archival control, integration of paper and nonpaper materials, new opportunities for information management, identification of appropriate hardware and software, staff training needs, and funding needs; and (3) current research and development in the areas of standards for archival description, control of terminology and concepts, data exchange formats, networks, and new technology. Several concrete examples illustrate the discussion. A list of countries participating in the study is included. (Contains 95 references.) (KRN)

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The impact of computerization on archival finding aids: a RAMP study

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THE IMPACT OF COMPUTERIZATION ON ARCHIVAL FINDING AIDS: A RAMP STUDY

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PREFACE

In order to aid Member States, particularly developing countries, to meet their needs in the specialized areas of Archives Administration and Records Managemant, the Division of the General Information Programme has developed a long-term Records and Archives Management Programme (RAMP).

The overall objectives of RAMP are:

- to create awareness and promote understanding, among and within governments of Member States, of the values and usefulness of records and archives as basic information resources;

- to assist countries and regions, upon request, in the organization and development of the records and archives management systems and services necessary for full and effective utilization of these basic information ressources;

- to promote and assist in the advancement and dissemination of knowledge through the training of professionals in the field of archives and records management which is the basis for sound archival policies and harmonious archival development.

RAMP avtivities concentrate on: infrastructure development; training and education; protection of the archival heritage; promotion of the development and application of modern information technologies and research in archival theory and practice.

The present study, prepared under contract with the International Council on Archives (ICA), is based on a questionnaire sent to selected National Archives and on interviews. It describes different models of archival finding aids in a computerized environment and discusses advantages and disadvantages of the automation of archives. A number of concrete examples illustrates the analysis. Current research and developments in this field are presented, and the importance of archival norms and standards is pointed out. The study closes with a select bibliography.

Comments and suggestions regarding the study should be addressed to the Division of the General Information Programme, UNESCO, 7, Place de Fontenoy, 75007 Paris, France. Other studies prepared under the RAMP programme may be obtained at the same address.

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1. INTRODUCTION

Terms of reference

The terms of reference of this RAMP study were to identify:

the types of archival finding aid which have been, or are being, computerised;

the lines of research currently in progress into the methodological and technical problems encountered by archivists applying computerisation in this field; and

those continuing problems which should be resolved as a matter of priority.

Context

It was requested that the survey should take account of current national and international research into the processes involved in archival description, and of efforts being made to draft, or where drafted to enforce, standards which should be applied to these processes.

Computers have given added urgency to these tasks because for maximum effectiveness they require information to be input in fully consistent and standard ways, otherwise it cannot be properly searched and retrieved by the user.

But there is another dimension to the current discussions. Provided that adequate standardisation is applied to the structure and format in which computerised data is held, it is possible for one computer to receive and assimilate information from another. This has far-reaching implications both nationally and internationally, and detailed research is therefore also in progress towards agreed standards in these areas. The issues are distinct from those concerning archival description (which is not necessarily computer-dependent), and their discussion may require rather different expertise, but in those countries where computers have already become well established instruments in the management of archival information, progress is seen to be required on both fronts.

Method of survey

Notice of this survey was circulated in a letter to

members of ICA's Committee on Automation (ICA/CDP) in October 1989. A draft questionnaire to national archives and similar institutions was discussed with members of Unesco's planning group on archival description standards meeting in Paris, December 1989 (see p.34). The definitive version of the questionnaire was then circulated to selected national institutions where computer applications were known to ICA to be established. Visits were paid to a number of national archival repositories in the United Kingdom and the United States of America.

It is not to be expected that a complete picture of the impact of computerisation upon archival finding aids can emerge from a study confined to national institutions, particularly those with advanced computer applications. As a control, therefore, additional information about local and specialist repositories and about applications in the developing countries was obtained by correspondence, by visits to a number of other repositories in the United Kingdom, by discussions with individual archivists from Canada, France, Malaysia, Spain, the United Kingdom, the United States and Zambia, and from reports and reviews of computer applications published in professional and technical journals or in the annual reports and other literature of individual archives.

The report tries to take account of the widely varying needs of different countries and different kinds of archives. Examples cited in the text have been drawn from sources as wide as possible in order to give some impression of the breadth of experiences represented in the information gathered.

The pace of change

It is worth reflecting that computerisation is still a recent phenomenon. The first archival applications, in North America and a few European countries, were developed only a little over two decades ago. Since that time the relative costs of hardware and software have sharply fallen and their relative power and range of functions sharply risen. Not surprisingly, then, a number of the countries covered in this survey only embraced computerisation in archives at all seriously in the last five to ten years, whilst others like India, Sri Lanka and New Zealand are just beginning. Many others have yet to take the first steps.

The pace of change is such that a problem which seemed insurmountable yesterday may today be a matter of mere routine, and what seemed like science fiction - the 'mouse', 'light-pen' or 'touch-sensitive screen', to say nothing of scanners or erasable optical disks - has already become a reality.

The limitations in the future, as one correspondent put it, may prove to be those of our own vision and not of the capabilities of the technology. We can only overcome them by sharing information and expertise.

References

Much of the detail cited in the report is taken directly from returns to the questionnaire. Other sources cited are mainly indicated in round brackets in the text, which refer to works listed in the bibliography (see Appendix).

A general introduction to many of the issues raised here as a result of comments received in reply to the questionnaire is to be found in a previous study in this series, Michael Cook, An introduction to archival automation (Cook, Paris 1986).

Levels of arrangement and description

The term fonds has been used in the narrative of the report to represent the highest level of archival entity, broadly corresponding with the group or collection in most English-language usage. In examples referring to particular countries, local usage in the returns to the questionnaire or in other sources cited has been followed. In general the term series corresponds with the United Kingdom's class and the item is the unit of production, although in this last respect usage is more variable and other terms such as box and folder (or piece in many United Kingdom archives) may be in use locally.

2. FINDING AIDS AND COMPUTERISATION

The purpose of this first main chapter is not to list all the various kinds of archival finding aid that have been computerised, although some indication of the likely range of any such list will emerge. It is rather to present an overview of the ways in which the computer is compelling archivists to broaden their horizons in the management and exploitation of information about archives, and in particular to reconsider what they mean by the term 'finding aid' in the context of computerisation.

Whilst some of the advantages and problems of computerisation are mentioned here in passing, more detailed treatment of those matters is reserved for chapter 3. Discussion of broader issues such as standardisation and authority control, which loom large in any assessment of computerisation in the field, is mainly postponed until chapter 4 together with aspects of current research and development including the creation of computer networks.

This division of the report's subject matter is designed to take account of the terms of reference set out in the Introduction. But it will be apparent that the issues are all closely related, that some of the examples adduced in one chapter might have been equally appropriate in another and, moreover, that very many additional examples for which there was no space might have been presented in evidence.

Computers could be regarded either as tools, in succession to the quill pen and the typewriter, for compiling archival finding aids of the now traditional kind, or as presenting altogether more radical propositions for the archivist and a whole new concept of finding aids.

Both views may be appropriate, and the former cannot be lightly dismissed. But it may be the ability or opportunity to see things from the second point of view that marks the real turning point for computer applications in archives.

On the whole, archivists were slow to respond to the challenge of computers. They lacked the resources to become deeply involved at an early date (when virtually all computer applications were on expensive mainframes), as well as the training to enable them to see the potential, alongside the problems, of computers. Their first steps were tentative and sceptical, often based on the premises either that the new technology was likely to

have little bearing on their discipline (because in the very nature of archives it could not be used, as it was by librarians, for common cataloguing of identical items) or that any impact it might have would be a matter for the next generation (Fishbein 1981; O'Neill 1986).

Word processing

Computer technology, however, has advanced at a pace beyond all early expectations and can no longer be ignored. For many archives the advent of affordable word processors (text processors), mainly during the 1980s, provided the first indications of how computers might transform traditional finding aids.

Here were machines that could quickly and painlessly accomplish feats of correction, substitution, spelling, layout and presentation beyond the capacity of the typewriter. The software was not of course initially designed with archival finding aids in mind, and in some cases archivists reported very basic problems, for example over clumsy word-wrap at the ends of lines, and inability to achieve a layout in multiple columns, or distortions caused by the machine's predetermined proportional spacing. But with persistence and experiment these snags were generally overcome, and it is needless to record in detail here the kinds of finding aid now produced by this means, for they are as numerous as those formerly committed to the typewriter.

The more serious problem of absorbing word-processed text into computer databases for analysis remains, and is considered in the next chapter.

Word processing continues to play an essential part in the production of detailed finding aids at lower levels of description (such as inventories or descriptive lists of items within a series/class) even in those archives with access to wider computer applications.

For smaller or less well resourced archives, word processing may for the moment remain the only available form of computerisation, but it is not on that account to be spurned. It can result in significant economies in the production of finding aids, as well as a better quality of presentation. With the help of even simple office copiers, multiple copies can if required be economically run off from word-processed output, and if still larger-scale publication or dissemination is required the output may serve as camera-ready copy for a printer.

A further stage has been reached in the publications of many archives where, either by the insertion of codes (tags) at key points in the text, or by format recognition, the output of the word processor, generally on floppy disk, can be transferred automatically to computer typesetting machinery which will print a text that is typographically superior to the word processor's output (and more varied if required). This technology has been widely used in other disciplines also, and strenuous (though not yet entirely successful) efforts are being made, as in the USA with the Text Encoding Initiative sponsored by the Association for Computers and the Humanities, the Association for Computational Linguistics and the Association for Literary and Linguistic Computing, to agree and standardise conventions and mark-up languages to facilitate this process. Despite the fact that many machines remain mutually incompatible, numerous archival texts and transcripts, guides and handbooks, catalogues and inventories, have already been produced by this means.

> When the British Library decided to computerise its Summary catalogues of manuscripts one of its primary considerations was that users familiar with the typography and conventions of the earlier volumes should not be confused by a new approach. The computer was therefore required to generate an end product looking as nearly like the previous volumes as possible. This has been successfully achieved using a commercial word-processing package, but with carefully controlled use of symbols including punctuation and carriage returns to enable the typesetter to recognise the format automatically and select the correct style and layout.

Databases

Although there continue to be 'dedicated' word processors (machines which can only perform this function), word processing is now more commonly just one operation undertaken on computers of all sizes, which have much wider potential. It is the ability to fathom and use that potential which marks the transition from the first to the second way of looking at computers in relation to archival finding aids.

Even with a simple microcomputer it is relatively straightforward to set up databases to control information about archives. With the greater capacity of minicomputers and mainframes and through networking, a

number of wider options may be available for databases, some of prodigious scope.

But some words of caution are necessary. As for any other computer application it is advisable first to identify the requirements and only then to seek the software and hardware that will fulfil them. The term 'database' covers a variety of different methods of storing and manipulating information. Considerable frustration may arise if a chosen system or package fails to match expectations, for example because it lacks the ability or the power to search or output the data in the form required or to cumulate it for wider use.

Archivists taking the first steps along this path should therefore be sure that either they or their technical advisers are aware of the range of 'hierarchical', 'network' and 'relational' databases on the one hand and 'free text' (inverted file) systems on the other - and indeed more recently of systems which combine these features - and that the chosen system or package will match their requirements.

Commonly, a database is a means of storing and manipulating by computer such information as can be presented in a structured form, ie where the various elements or 'fields' of information can be readily distinguished. Many of the elements of traditional archival finding aids precisely match this requirement (call number, date, description; originating entity, series title, quantity, etc) and can easily be made the subject of databases. Moreover, where the fields are already clearly distinguished in the layout of existing finding aids, or are capable of being so distinguished by the insertion into the text of symbols or 'tags', it may be feasible by rekeying the data into the computer field by field, by encoding the word-processed file, or by automated means such as optical character recognition to incorporate pre-existent information into databases, and not merely to begin with new information assembled after the advent of the computer.

Of the database applications reported in response to the questionnaire, many cover those archival sources that are richest in topographical or genealogical information which is everywhere high in demand from the users of archives.

> They have been created, for example, for census records (Public Record Office, UK), land tax (Ontario), land grants 1800-1948 (Sri Lanka), land surveys (Italy), registers of appointments (Malaysia), notarial records

and correspondence (a number of places including Italy, Utrecht), building plans before 1900 (Singapore), etc.

In Switzerland the first steps have been taken towards the creation of a database which will contain information on some 2 million individuals with from 10 to 30 attributes for each.

Some more academically orientated projects covering a wide range of fonds were also reported, such as the database of records for the history of Hungary up to 1526 AD, and the large-scale collaborative project between the archives of Italy and Spain to identify source materials for the history of each country in the archives of the other.

Catalogues of 'non-text' media, where information commonly needs to be retrieved under a number of different headings such as originator, date or topic, are also proving popular for database applications. Among those specifically noted by the survey were catalogues of maps (Canada, UK), photographs (Malaysia, Singapore, UK, USA), audio visual archives (Hungary, USA, Zimbabwe), microfilmed records (Sweden) and electronic records (Belgium).

New concepts of archival information

Databases are entirely different from traditional finding aids. The information in them need not be printed out but can be interrogated at the computer screen by means of commands or queries. Depending on the software and hardware used, the computer may be able to output the entire content of the database, in printed form or on microfiche. It will normally also be capable of presenting that information in a number of different ways, for example re-ordering it chronologically, alphabetically or by subject matter. It may be capable of selective searches by field or key-word, and of indexing. These and other advantages are further discussed in the next chapter.

In other words a database can be seen as a single, integrated finding aid in its own right or as the potential source of a number of different kinds of finding aid (which need only be printed out, in whole or in part, if there is a demand), all stemming from the same input information.

A simple database application may have the short-term and finite purpose of manipulating information about, for

example, a single series (class) of records in order to produce one or more finding aids for public or administrative use. A number of packages have been developed with this specific end in view, including MAIS in the Netherlands which produces preliminary and detailed inventories, indexes of names and subjects, and concordances (Archival Informatics Newsletter 1/2 (1987) p.20). In such a case the data may then be static, in the sense of never needing to be changed or aggregated with other information.

But computerisation may offer the wider vision of information which is dynamic, which can be stored and amended or added to on a regular basis and need never be the same on two consecutive days. In these circumstances perhaps it would be more appropriate to pose the question: when (rather than what) is a finding aid?

Database applications are as widespread among the specific kinds of finding aid required for modern records management and repository control as they are among those designed for public use. Many national and local as well as business and specialist archives now use computers to generate, or hold the equivalent of, their transfer lists, accessions registers, location lists, retention and disposal schedules and their tracking records for conservation, reprographics and other aspects of in-house management (Cook, Paris 1986, pp.17-19,30-31).

> One of the best known systems, because it was widely demonstrated to archivists attending the ICA Congress in Paris, 1988, is the PRIAM 3 application operating at the Centre des Archives Contemporaines, Fontainebleau. Described by its custodians as a référothèque, the system records the existence and location of all records transferred to the Centre and describes and indexes them in summary form, the description being deliberately kept to a minimum to enable computerisation and control of a great bulk of records to proceed according to plan. Selective subject indexing is undertaken, by means of which it has been found possible to draw together information about fonds now dispersed among the records of several transferring agencies, such as the archives of the Suez Canal company.

Computerisation, as we shall see in more detail below, is serving to break down many practical or conceptual barriers within archivistics. It is no longer necessary to regard the description of archives for the benefit of the user as a process wholly distinct from the control of

information about the same archives for administrative and management purposes. This in turn is resulting in new kinds of database and new kinds of finding aid.

Integrated systems

A number of local and specialist archives, where the bulk of holdings is smaller than at national level, are already well advanced along the path of integrated control, with systems which can handle information about all their holdings irrespective of the storage medium, and include management functions.

One such system RAPIDE, in use at the Katholiek Documentatie Centrum, Nijmegen, Netherlands, has been described in ADPA, the journal of ICA's Automation Committee (Soetart 1985). Other examples include the GAIA application in the French department of Seine-et-Marne, and North Carolina's MARS application.

The development of the USMARC:amc format, discussed more fully below, has similarly enabled many archives in the United States to integrate the control and description of their holdings (see pp.43-45).

The British Manual of archival description and its application in the Portuguese system ARQBASE (see pp.45-46) offer similar options for integrated control.

A number of the larger national archives, where the bulk of records and information to be handled is very much greater, have similarly begun to implement or explore integrated or overarching computer systems which will tie together some or all of their hitherto separate computer applications and link all aspects of control and information. The proliferation of many separate systems and the initial absence of an overall strategy has proved a significant problem for management.

In Canada the Archival Holdings System will link information previously held in over 30 different computer systems throughout the National Archives.

In the United Kingdom the Public Record Office's Records Information System will bring together repository control and the data for the publicly available Current Guide to holdings, which includes

administrative histories of the archive-creating departments and agencies and summary descriptions of holdings at group and class levels.

In the National Archives of the United States the Archival Information System (AIS) (see p.16) will embrace series- and, where available, folder-level description of federal records and item-level descriptions of special categories of records including motion-picture film and machine-readable data sets. It will also draw upon information in the US Government Manual and the Guide to the National Archives, as well as information from existing inventories (captured by optical character recognition) and databases. It is expected that points of access to the new system will include agency history, biography, government function or specific program, and authorised topic terms.

Sweden has recently begun work on a national archival database to link the information contained in existing national and provincial databases, together with authority files, data on the changing geographical districts, and information gathered from archivists themselves.

Guides to individual repositories (Cook, Paris 1986 pp.23-24)

The production of guides to the contents of individual archive repositories had been a priority in several countries before computerisation (see for example Van Driel 1984), but the process has been greatly facilitated by the computer. A number of respondents to the questionnaire (Netherlands, Hungary, UK) emphasised the ease with which summary guides could now be produced, and in some countries software has been specifically developed with this in mind, as in the ARCHEION application in the Netherlands (Horsman 1988).

At the same time there has been a considerable reappraisal of what a guide should contain. More emphasis than in the past is being placed on explaining the historical or administrative framework within which the archives were created.

In some countries what might be described as ancillary databases have been established primarily to supply information about the originators of the archives, whether institutions or individuals.

In Brazil, for example, the MAPA database contains, for

each agency of government, its name, functions, details of predecessor or successor bodies with the same functions, and information about relevant legislation affecting its operation (Azevedo 1986).

Elsewhere the same kind of information is being fully integrated into computer-based guides (as in the cases of the UK and USA noted above) or is being provided for as a function of a database working towards a future guide of this kind (ARQBASE in Portugal).

RINSE and ANGAM in Australia

In Australia computerisation has been taking place concurrently with the creation of a national archive service under the recent archive legislation, and the opportunity has been taken to develop further that country's distinctive approach to arrangement, classification and authority control (Scott 1966 etc; see also Australia).

In 1983, when under the Australian Archives Act it became mandatory for the Archives to make publicly available information about the archives which were open to inspection and to explain any reason for withholding such access, a new central data bank was established (initially on paper) for official use, known as the Australian National Register of Records. This set out to aggregate information contained in the records themselves, in official government publications, and from the personal knowledge of administrators and archivists about the institutions and agencies and also about the private individuals whose papers are held by Australian Archives.

A review of the processes for handling information throughout the Commonwealth of Australia led to the formation in 1983/84 of an ADP strategic plan. It was concluded that computerisation would offer a cost-effective means of handling such central information and fulfilling the new legal requirements.

Two main applications were established. The first is a Records Information System (RINSE) carrying, for all archives held by Australian Archives, details of the creating agencies, persons, organisation or families respectively and of the related record series. Microfiche print-outs of this data, with paper supplements for data not yet computerised, together constitute part I of the Australian National Guide to Archival Material (ANGAM). The second database, which forms part II of the guide and

is therefore known as ANGAM II, gives the number, title, date-range and location for each series of records over 30 years old, together with a note of their availability in accordance with the Archives Act.

Overall access through the ANGAM index (on fiche, with paper supplements) is by title of the creating agency. The user is introduced to the provenance-based approach to the records by means of information leaflets. The database can be searched on-line using the item number or subject key-words.

Here, as elsewhere in national archives, there is no central index to item-level inventories, but any indexes, registers etc transferred by the creating agency are carefully noted. The Physical Control System (PCS) of Australian Archives, however, is not linked to the other computerised systems.

One component of the Australian system which may be unfamiliar elsewhere as a form of finding aid is the registration. This is normally compiled at each of two levels: to describe (a) the record-creating agency/institution/person/family, and (b) the individual record series transferred to the Archives. The nearest equivalents elsewhere would be (a) a fonds/group-level description and (b) a series/class-level description, but the concepts are rather different. The agency registration gives the agency's name, the running number allocated to it by Australian Archives, notes on its history including its operational dates, cross-references to predecessor and successor bodies and a list of the record series generated by that agency. The series registration gives corresponding concise information about the series and its relationship to other transferred records.

Inventories are provided, summarising the available series, and at a lower level the items within each series.

Some examples of inter-repository guides

In a number of countries including the United Kingdom, Norway and Sweden, national registers of the papers of private individuals, families and institutions have been computerised.

The National Register of Archives (UK), established in 1945 and maintained by the Royal Commission on

Historical Manuscripts, receives unpublished and published finding aids of all kinds from record repositories and from private sources, relating to archives and papers of interest to British history. The finding aids themselves are held in hard copy but summary information about them is now held on-line in a computer database which includes details of the collection or series title, its location, and indexes of persons, companies and other record-creating entities including churches, hospitals, schools, trade unions and families. As with the Swedish National Catalogue of Private Papers, the levels and structure of indexing and description for national purposes are quite independent of those adopted by the originators. The same relational database holds information about Britain's record repositories, their addresses and telephone numbers, the archivist in charge, opening hours, and facilities. Data from this file will be used in the creation of the forthcoming 9th edition of the Commission's directory Record repositories in Great Britain.

The largest computerised inter-repository guide is probably the second edition of the USA's National Historical Publications and Records Commission Directory of archives and manuscript repositories in the United States (Oryx Press, Phoenix, 1988).

This covers over 4,500 institutions and in addition to the kind of information in the British directory includes brief details of each institution's holdings. Its production encountered problems, including the lack of an inter-active mode for correcting and updating files and the hardware dependency of the SPINDEX application (see the Directory's introduction) but it is still an impressive work, made possible in this form largely by computer technology.

Also in the USA, the National union catalog of manuscript collections maintained by the Library of Congress is another example of an inter-repository guide that is now being greatly facilitated by computerisation. Although to many libraries it is still best known in its printed form, its data is now entered into the on-line computer network RLIN discussed more fully below.

At a more local level the city and county archives of Stockholm, Sweden, has developed a regional catalogue covering all the archives in the county.

Individual scholars and researchers, academic institutions

and learned bodies, and even pressure groups, are also widely engaged in the creation of computer databases about the archival sources of special interest to them. These are not 'archival finding aids' in the accepted sense of the term, and indeed may never have been near an archivist at any stage in their preparation. But they are certainly a force to be reckoned with and will be widely used as points of access to archival information.

> In the United Kingdom, for example, nationwide databases covering the contents of many archives as well as records in private ownership have been or are about to be created for hospital archives, medical archives, papers of senior military and naval staff of the 19th and 20th centuries, sources of art history, business history, garden history, computer history, and English literary manuscripts from the 18th to the 20th century.

To summarise, then, very few kinds of finding aids from the pre-computer age cannot be reproduced in computerised form, but more importantly the computer has opened up a new range of possibilities for the handling of archival information of all kinds. The benefits as well as the problems are assessed in the next chapter.

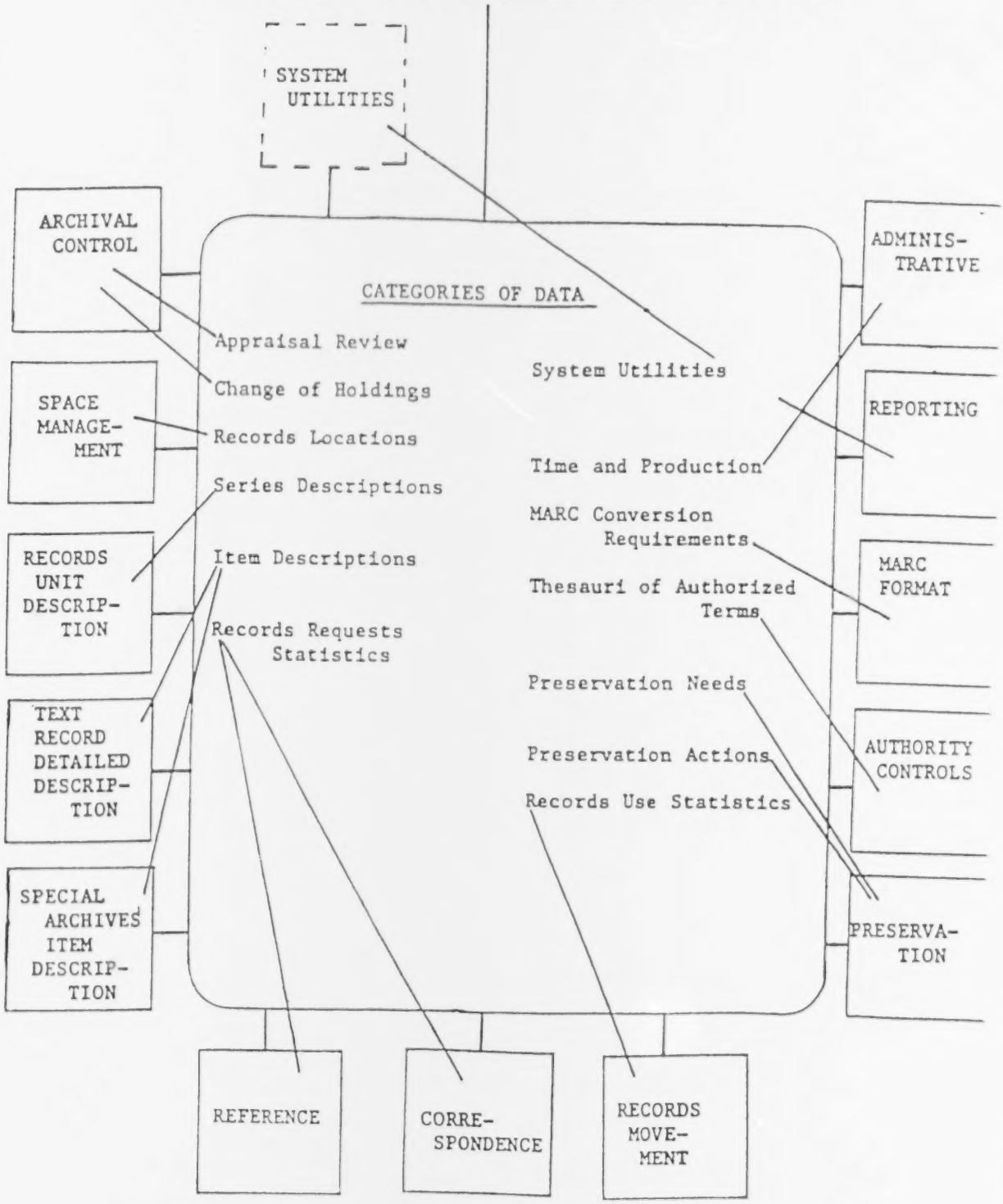

Figure. The United States Archival Information System

3. ADVANTAGES AND PROBLEMS OF COMPUTERISATION

Advantages

To describe the problems associated with the computerisation of archival finding aids without first pausing to consider some of the advantages would be to misrepresent the predominant mood among archivists today. There is no doubt that real benefits are being widely felt from computerisation. This is fully borne out by current professional and technical literature as well as in the responses to the questionnaire for this survey.

The major benefits include:

Enhanced control by archivists over the growing mountains of information of all kinds at their disposal, whether concerning management and physical control of the archives on the one hand or intellectual control over their arrangement and content on the other.

A wider vision of what 'information' is and how archival information relates to other aspects of national and international information policy and resources. This is resulting in more dialogue both among archivists themselves and between archivists and other 'information professionals', especially librarians and museum curators, and a greater desire on the part of archivists to be represented in the technical discussions which will affect their future.

The breaking down of other conceptual barriers, such as the distinction between paper and non-paper, or 'traditional' and 'new' media. This is resulting increasingly in moves towards the integration of information management irrespective of medium, and affording scholars working on the archives, as well as archivists themselves, opportunities for better-targeted searches throughout a wider field of information.

The incentive to overhaul traditional practices of archival description, to achieve greater consistency and precision, and sometimes a better quality of output for finding aids, whether within a single archives or at national or international levels. This is resulting in discussions of agreed national and international standards in this field, and the development of the means of exchanging data.

Many individual practical benefits are described at greater length below. These were encapsulated by one respondent as 'savings in energy, cost and time', the energy in this case being that of the staff rather than of the power required to drive the machines! In many applications the computer has obviated whole processes including form-filling, drafting and re-drafting in manuscript and typescript, correction and re-typing and proof-reading, although a number of archives still appear to prefer to make their initial data capture in manuscript on paper or forms, in order to facilitate checking, rather than to have the work done directly at computer terminals.

Savings in cost continue to defy quantification. Only a small minority of respondents admitted to having undertaken any cost-benefit analysis in this specific field, although many could point to 'reduced unit costs' or 'reduced handling time' per transaction.

> Australian Archives, for example, estimates that the RINSE application (see above, p.12) has resulted in a 25 per cent saving in time for processing data, and makes the information available in the 8 offices of the Archives within 24 hours where the previous average might have been 6 months.

A corollary of the computer's tackling the old jobs at greater speed is that it allows time for more jobs to be done. It has been a special source of satisfaction that backlogs of work have been seen to dwindle; indeed some have felt this to be the principal benefit from computerisation.

The third practical benefit from computerisation has been in opening up entirely new possibilities in information management. Most significantly, as explained in the previous chapter, information can now be dynamic, growing continuously as data is accrued. Users can be offered completely up-to-date information through inter-active, on-line searches. They can have answers more precisely matching their questions, or even customised guides to their research material.

These options are not of course open to all archives, but almost all those using computers have derived other new benefits. With the right kind of hardware and software, as one respondent put it, you pay once for the data input, but then you have a multiplicity of options for using it.

Reported advantages include automatically-generated

indexes for finding aids which would previously have had none; cumulative indexes combining data from a number of different sources; more precise searches and a greater rate of 'hits'; the re-ordering of disordered or poorly catalogued items within an inventory; and amendment facilities enabling a word or phrase to be changed wherever it occurs throughout a finding aid or database, from a single input.

To take just a few examples of operations which were not practical before computerisation but have now become so:

The French National Archives's EGERIE database for searching the contents of the Etat général des fonds has been found to have a number of advantages over conventional finding aids. First, of course, it gives ready access to summary information covering a great number of fonds, but more particularly it does so at speed, with the facility for searches by key-word, and by combinations of key-words using Boolean operators, across several fields (Cloulas 1985).

In the United Kingdom, the Public Record Office has used a simple database application to re-list in box order a class of Admiralty records formerly arranged alphabetically by name of ship. At a very early stage in its explorations of computerisation the PRO discovered the potential of this kind of program for describing, in the order in which they were inspected, badly damaged records from a single class which could not at that stage be arranged without further damage, and re-ordering the information into a logical class list by automated means (Post 1988).

In Italy, the telegrams of the Coding Bureau (Ufficio Cifra) which were badly decayed were transcribed into a machine-readable format for consultation, in order to save wear and tear on the originals. The system simultaneously provided an index of sender, addressee and subject (Mariani-Rinaldi 1981).

The general archives of Belgium compiled by automated means an improved analysis of the correspondence of the Count of Mercy-Argenteau (now held in Austria), using a simple database application (Pieyns-Rigo 1985).

The British Library Department of Western Manuscripts has developed a program using REVELATION software to supply appropriate MARC tags for all the automated indexing data for its Summary catalogues of Manuscripts: the indexers require no knowledge of MARC.

The ability of an archives to derive benefit from computer applications to its finding aids, however, varies according to local circumstances. Any list of the factors determining success would have to include the following:

A robust attitude of mind, determined wherever possible to use the computer to serve the needs of the archives rather than the other way round. This calls for careful systems analysis in advance of computerisation, to determine not only the ways in which information is currently handled but also how this will be equalled or improved in a computerised environment, at what cost, and with what consequences for working practices and for the structure of the organisation (O'Neill 1986).

The ability, or in some cases the freedom, to identify appropriate software and hardware to fulfil the requirements for the system.

Access to the financial and manpower resources, as well as the technical skills to implement, maintain and develop the system and to derive the greatest benefits which it is capable of delivering.

Consultation with, and appropriate training for, the staff involved in implementing, maintaining and exploiting the system.

The development of consistency in the methods of archival description.

The opportunity to exchange ideas and discuss problems as widely as possible with other archivists engaged in computerisation, particularly those using the same or similar systems.

The lack of some or all of these preconditions has caused many of the problems reported during this survey that are discussed below.

Problems

Many of the problems associated with archival computerisation have already been identified in the earlier RAMP study by Michael Cook (1986 pp.32-40). But it is evident from returns to the questionnaire and discussions with individual archivists that the same problems continue to be experienced.

Once again it should not be overlooked that the needs and scale of requirements of any two archives can be very different. The ideal computer system for one may not at all suit the next, and the most important considerations are that the system chosen should as nearly as possible match the needs of the institution and be sustainable within its present or expected resources and skills. If for the time being this means limiting horizons to a word processor or a small database application on a microcomputer, that option should be explored.

Even the humblest first-time user, however, must be aware that aspirations and opportunities, as well as the technology, change as one is in the very course of familiarisation with a system and its advantages or limitations. If there is a short- to medium-term goal of a higher kind, such as the creation of larger, relational databases or the exchange of information with other institutions, care should be taken from the start if possible to do nothing that would make this more difficult. The kind of practical problems recorded below, however, may determine that decisions and progress have to be made in the light of existing constraints, setting aside some of the higher aspirations.

Software and hardware

The identification of software and hardware appropriate to the task was one of the problems most commonly cited in response to the questionnaire.

Where the archives has freedom of choice in the matter, the selection of the right software is often the higher priority, in the form either of a commercial package which will satisfy all or most of the operational requirement arising from the systems analysis, or of software which can be developed and adapted as necessary.

The archivist must be alert, however, to the difference between, on the one hand, the minor compromise to meet constraints intrinsic to a particular system (such as, for example, a simplified form of alphabetisation in indexing, as reported in the Directory of archives and manuscript repositories in the United States (1988, p.xii)), and, on the other hand, compromises of such magnitude that they result in major inconvenience, as where a system can work only in structured fields where free text is required, or only in controlled language where natural language would be preferable. Whilst it may be true that even an imperfect system may be used as a means of familiarisation

with computers (MacDermaid 1990) it is better if possible to avoid such frustrations.

The notorious tendency to obsolescence of both hardware and software has given many small repositories in particular problems in knowing how and when to leap on the computer band-wagon. Much hardware has a lifespan of five years or less. Commercial software is being developed almost continuously, and the ability to switch to the most recent releases/editions can bring considerable advantages. Viewed as a purely financial problem, this has been somewhat mitigated in recent years by the steep relative fall in prices of microcomputers and their software, and the great increase in their power and capabilities which in turn is leading to much less reliance than in the past upon mainframe computers, and to the rapid development of distributed systems and local networks.

> The Society of American Archivists has appointed an automation program officer to advise members on computer applications, a practice which could be widely commended at national level elsewhere unless there is already an appropriate advisory infrastructure through the central direction of archives.
>
> In countries where computer applications in archives are numerous, it is an increasingly common practice, as in the United Kingdom, for archivists to form 'user groups', in which those having the same software application can exchange advice, and even make representations to manufacturers.

Commercially available software applications have been found entirely satisfactory by many archives for word processing applications and for creating simple databases. But few respondents to the questionnaire were so enthusiastic about their current software as to wish to recommend it to others internationally.

> TEXTO was commended by the Centre des Archives Contemporaines, Fontainebleau, France as being user-friendly, requiring no previous knowledge of computers, and offering good interrogation and output facilities.
>
> ASK SAM was recommended by the Archives Centre at Maribor, Yugoslavia, for its ability to handle both free text and structured information.
>
> Unesco's CDS/ISIS and its derivatives (with users as

far afield as Hungary and Zimbabwe, Canada and China, the Soviet Union and Portugal), have a growing and evidently enthusiastic following. Originally designed with libraries in mind, they have been found very suitable also for archival applications.

Many national archives, sometimes in addition to using standard packages, have had to have software developed to meet their specific needs, either by their own in-house specialists or in collaboration with, for example, government or university computing centres or with regional or local archives (in Belgium, Liège university; in Sweden, Lund regional archives). Applications thus tailored for use in one archives should in theory have wide potential in others, but in relatively few countries, it seems, has there yet been a significant move towards standardising the software in use throughout the various archives (e.g. MAIS in the Netherlands, ARQBASE in Portugal, with similar developments under way in Norway and Sweden). Still less have such tailor-made applications yet been known to cross national boundaries. Among examples reported to the survey was MAIS which is being translated into French for experimental use in Belgium.

Choice of hardware and software may be artificially restricted by considerations outside the archivist's control. The desired application, if foreign, may not be readily available owing to cost or current trading practices. The archivist based in, say, a library environment may be obliged to use the same system as the parent authority, even if its primary use was for a method of bibliographical control which is not in every respect suited to archives. At the level of local or central government, the parent authority will commonly have existing computer applications designed to meet its own administrative requirements, with the result that the archives may have to adopt the same or a compatible system if it is to make any cost-effective and properly supported advance in computerisation, regardless of whether that offers the best solutions for the archives. Worse, these imposed systems may be dependent on a particular kind of hardware or software which might not be compatible with the potential electronic transfer of information between archives. It is in order to overcome the last problem that the MARC:amc format, which is not system-dependent, has been devised in the USA (see p.43). To quote one authority, 'the archivist needs to be adaptable and pragmatic in order to make reasonable use of what actually is available' (Post 1988).

Incompatibility between one system and another continues to cause inconvenience, to put it no more strongly.

> The Direction des Archives de France, for example, is one apparently centralised authority which does not in practice control the purchase of hardware and software by the regional (departmental) administrations (see, for example, Gazette des Archives, 141 (1988), p.133).
>
> In the United Kingdom, the Public Record Office has no central control over the archives of local government. As microcomputers have burgeoned around the country the prospect of any unified national approach to software applications has vanished (Roper 1989). Nor does the PRO control the software used in government departments by those drafting class lists of records for transfer to the archives. It has, however, recently standardised most of its own in-house software applications to simplify management and control.

Choosing software is only a preliminary to making it satisfy the user's requirements. But that too has given rise to its own particular problems: lack of senior staff time to plan and supervise the application; lack of understanding of archival concepts by outside developers and of computer concepts by senior staff in the archives; lack of staff training to develop the software properly and recognise any snags; strong resistance from professional colleagues trained in a pre-computer age or on earlier computer systems; lack of technical support from the manufacturer or developer.

Regrettably, it is also the case that commercially available software is often furnished with poorly written manuals and may need expert intervention before it becomes fully user-friendly. This depends, however, to some extent on the technical knowledge or training of the user. The number of purely technical problems that have not been solved by someone is relatively small, but most archival users operate in a restricted computer environment, some in total isolation, and this has the effect of magnifying the inconvenience of problems experienced.

In all these matters, the low profile of archives in relation to other services at both local and national levels continues to attract comment. To make only the comparison with libraries and museums, archives are fewer in number and the profession much smaller. Apart from the obvious difficulties which this presents in attracting resources in the first place, there are other problems specific to the present discussion. As a specialised

market for computer applications, archives has been too small to attract real interest from most software manufacturers. On another plane, archivists have found it difficult to achieve adequate representation on some national Standards committees or to make their voice heard alongside the stronger lobby of librarians. It is noticeable, particularly in the field of standardisation, that many achievements have come about largely through the determined efforts of individuals or groups of archivists, persistently working through complex problems with at best unofficial backing from their professional bodies (which generally lack the funds to make a greater commitment on any one front at a given moment, and have in any case many other issues to tackle simultaneously). But the responsibility cannot indefinitely rest with individuals: sooner or later the initiative has to pass to some form of national organisation.

Training

The complexity of computer technology and its rapid development have given rise to another set of problems. The number of archivists who are fully cognisant in this field is tiny. There is a great need for more training, both at national and international levels, nowadays not only basic familiarisation with computers but increasingly in-depth training to equip at least some specialists in each country, or in groups of countries such as the regional branches of ICA, with the vision to lead archives sensibly through what might otherwise be a minefield.

Finance

Finance remains a problem everywhere, and for all the cost benefits that can be marshalled in its defence there is no contesting that computerisation can be a very expensive process.

Virtually every respondent to the questionnaire reported that the entire charge of computer development had fallen upon the budget of the institution itself. Commercial and private sponsorship is extremely rare at national level, though it has been achieved in Spain in the Archive of the Indies optical disk project (see p.55), and special subventions from other public funds have been made available to support research and development as in Canada, the United States and the United Kingdom (see p.47). A number of universities and colleges, as in Canada (MacDermaid 1990) have obtained grant aid for the

purchase of computers.

Finding the money even to take the most tentative first steps is a hurdle for some of the developing countries, where the millions of dollars made available (we might now almost say required) in North America for computer developments in archives can only be looked on with envy if not disbelief. The ICA with Unesco might wish to explore further financial as well as technical aid for appropriate computerisation projects in these countries.

Data capture and back-loading

The costs and problems associated with the capture of data from those finding aids which were completed before the advent of computerisation, and from finding aids produced by word processing rather than in a structured form, are widely recognised.

Archives faced with a formidable quantity of back data have often chosen, at least for the present, to ignore the problem and computerise only newly accruing data. Some, on the other hand, like the Archives Nationales in France, Australian Archives and the National Register of Archives (UK), have embarked upon major programmes of backloading in order to establish comprehensive databases. This can be a massive manpower commitment and may involve the employment of additional, sometimes agency, staff. But the end results have been found to be worthwhile.

The larger archives have generally chosen to computerise mainly selected information at the fonds level, geared to the production of repository or topic guides. Some, however, as in Norway, are moving towards a new description format for all information even down to item level, and for smaller (eg local and specialist) archives elsewhere this may be a realistic option. It is provided for in the exchange formats discussed in the next chapter.

The methods of data capture vary from rekeying the information from the original means of reference to scanning it digitally or by optical character recognition (OCR) techniques. Several respondents including those from Norway and the United States reported major concern over capturing word-processed text for computer databases, whilst Hungary reported solving this problem. With some commercial software it is now feasible to tag an already word-processed file and download it into a relational database for merger with other data. The problem is

rather one of scale, both in terms of the volume of work to be done and the size of the resulting files of data as the process is repeated frequently.

The traditional methods of marking the original finding aids, or a photocopy of them, with the symbols and comments necessary to indicate to a keyboarder the beginnings and endings of each field of data, or to supply information previously assumed or left blank, have been fully described (Arad 1981 (2), 1987; Cloulas 1985). But these are labour-intensive and do not suit the needs of every archives. Data such as geographical locations or country names which could be left implicit in a manual system may have to be supplied to enable the computer to make a comprehensive and successful search. Associated and linked words may need to be indicated, and if the system is to be exploited to the full it may be necessary to indicate or supply key-words or explanations of context to assist searches and indexes.

Access by topic, by personal or place name, and by medium or format of the records described are all being developed alongside the traditional access by provenance and by call number. There is in particular a growing demand for topic-based access which requires more subject indexing than has traditionally been provided for in national archives but which seems increasingly necessary where information on archives is to be merged in databases with, for example, bibliographical information. But this cannot be achieved without a commitment of resources.

Those just beginning may be able to avoid entirely some of the problems rehearsed above, by using a completely free-text (inverted file) system such as STATUS (Woolgar 1988) or one of the new systems now appearing commercially which claim to be able to merge free text and structured file data.

Only a few respondents reported real success with OCR as a means of data capture. First of all, it requires additional equipment which may not be available. The Soviet Union has found it unsuitable for its earlier finding aids in manuscript, the Public Record Office (UK) because the earlier data is not adequately structured. Norway also reports that its early experiments have not been promising. But the capabilities of this technology are advancing rapidly (Allen 1986, Gillett 1988).

As data from a number of different sources accumulates, some of it may well be found to duplicate existing information ('data redundancy') or to express it in a

slightly different way ('data anomaly') - problems highlighted by the National Archives of Canada. Provided that there is time to resolve these matters, the opportunity created for 'data clean-up' is generally welcome. Clean-up may also be required on freshly keyed information. Australian Archives employed contractors to key in data which was then checked by archives staff before being run on to a mainframe computer overnight.

Errors of even a single keystroke, which would be recognised as such in a typescript finding aid, can lead to the effective loss of data to searchers using a computer. In these cases even the old adage 'garbage in, garbage out' becomes too generous because searches may fail to yield any result at all, when in fact the information is there, but in garbled form. These problems may to some extent be resolved where the system is capable of truncated or 'fuzzy' searches to identify terms similar to the one being sought.

Identifying the user

Searches - but by whom? One of the most fundamental issues to be considered is the user community. For whom is the computer system designed? For archivists? For record-originators in government departments etc? For the public? Can they all be served by the same system or are their needs sufficiently different to justify different approaches for different user groups? Do we know sufficiently well who the users are and what is the nature of their demands upon the computerised information? Should they be consulted? How practical is it to unleash any given category of user on-line on a live database, or even off-line by means of disks or CD-ROM? These questions are being widely addressed in Europe and North America.

Most respondents to the questionnaire said that their computerised finding aids were designed with all three kinds of user in mind, or at least the archivist and the public. In practice they have usually been designed by or for archivists, and make assumptions as to the user's familiarity with archival conventions respecting provenance. The public may need, and indeed are sometimes given, fairly detailed guidance to get the best out of such systems. They may need separate screen-prompts and 'menus' from those designed for the archivist.

There are good reasons for allowing the public (with suitable safeguards) on-line access to computer

data-bases: freedom of information, the provision of the very latest information. But there are often compelling reasons for not doing so. In some archives 70 to 80 per cent of users are genealogists or local or family historians, characteristically making a single visit to discover or check one piece of information. It is impractical to explain the use of the computer to each one.

> In the Public Record Office (UK) the Current Guide to holdings, although fully automated, is made available to searchers in print-out or microfiche form. The Soviet Union reported that it was normally more economical for staff rather than the public to sit at a keyboard.

In smaller repositories particularly there may be too few computer terminals to allow public access, or their dedication to this use may reduce response times and other facilities for staff.

Charges?

Many archives have traditionally prided themselves on the supply of information free of charge to users, except perhaps where any appreciable research is undertaken to obtain the information.

A question now being asked, especially in the USA, is whether and for how long such a free service can continue in respect of computerised information. This is especially pertinent in the case of information obtained from a proprietary computer network, for membership of which the archives may itself have to pay substantial subscription fees and telephone connection charges. It may be practical by means of a modem link and the national telecommunications network for the remote user to obtain the information at home and be charged pro rata for the use of the service. In France there are plans to allow public access to certain databases in the user's home through the MINITEL computerised telecommunications system. Should the service be free if instead he presents himself at the archives?

Security

Any kind of user-access to live data, even by the archives' own staff, must be properly controlled to ensure that only authorised persons may enter and amend or delete

information. To a large extent provision for this kind of security is written into the operating system itself, and is no more difficult to arrange than the 'menus' or questions designed to help any user to reach the desired information, but it must be competently set up and maintained.

Quite commonly a computer system will include whole areas of management or confidential data to which there should be no public access. The Centre des Archives Contemporaines, Fontainebleau, is deferring direct public access to its database until the ability to protect confidential data is guaranteed. Similar reservations apply in other national archival institutions, although no respondent mentioned any particular security problems of the kind regularly reported in the press: computer 'hackers' using telephone modem links to break their way into other people's data, or sowing 'viruses', 'worms' or 'Trojan horses' which gradually corrupt or destroy the data. It would be imprudent to say that these problems cannot affect archives, but with vigilance they may perhaps be avoided.

Computerised data is vulnerable in quite different ways from that contained in earlier means of reference. A determined vandal with a magnet may be capable of wiping clean a database. Power surges or an earthquake may do the same. Computer fires are by no means unknown. It is therefore essential to maintain adequate back-up facilities such as up-to-date duplicate disks or tapes stored away from the location of the main data.

Back-up

If the mention of some of these hazards seems a little alarmist, more common practical problems arise when for any reason the computer is 'down' or 'crashes', and it is important to have a strategy for recovery and for servicing user demand in the meanwhile. Australian Archives keeps complete paper and fiche back-up copies of its computerised data. But many would find this an unworkable solution on account of the bulk or form of data and the expense involved. The maintenance of anything like a complete dual system (computerised and manual) cannot, however, be recommended as an alternative to a determination to secure the successful operation of the new technology.

Updating

A problem somewhat related to back-up is that of the maintenance or updating of information once entered on the system. For many archival applications, data will be entered once for all, describing a fonds (etc) which is finite and will not be altered. But this is by no means always the case, and the problem looms especially large in relation to the networks described below and to the specialist surveys by academics etc mentioned briefly above.

The data is collected, processed and entered into the database, but then what? Does anyone maintain it, or does it go progressively out of date, as would have been the case with a printed volume? How, if at all, may it be made publicly available? And if it is out of date has some indication been given of the date at which it was compiled? The onus must rest on the original data supplier, and in the case of surveys with a finite duration these issues should ideally be resolved before the database is compiled.

Documentation

It has already been pointed out that commercial software does not always come complete with a readily intelligible manual. For the many national archives which have to develop their own applications rather than using standard software packages, there is a risk of the system's becoming complex, and difficult for new generations of programmers to understand. The need to simplify a complex system was identified as a priority in the Norwegian reply to the questionnaire and has also been a concern of the National Register of Archives (UK). Everywhere it is essential for programmers to ensure that their steps are clearly documented for their successors. In this respect the computer systems which produce, or serve as, archival finding aids are not dissimilar from electronic records which may be received as archival holdings, whose adequate documentation is crucial to their proper use and interpretation.

Electronic records

While the survey was in preparation a far-ranging report was published by the United Nations' Advisory Committee for the Coordination of Information Systems, under the title Management of electronic records: issues and

guidelines (United Nations 1990). Although addressed first to the constituent organisations of the United Nations, the report raises issues which are being or will be faced by archivists and records managers wherever electronic records are created.

It points out the urgent need for archivists to be trained so that they can be fully involved in the design of electronic information systems and their documentation from the moment of creation. It also suggests [p.58] that at present metadata systems (for description of electronic records) are not consonant with the formats being evolved for describing other media, as discussed below.

The complexity of the issues involved requires the lead in this field to be taken by concerned national archives, as is already being done in the USA, in close collaboration with the professional associations of archivists which must seek full representation on the committees of both the national and the international Standards organisations addressing these problems. The national archives of Norway and Sweden have already agreed on a joint approach to such questions.

A number of additional problems of a more local nature were reported during the survey. Attention here has been focussed mainly on those affecting the widest constituency.

Some of these have been seen to be of a practical or managerial nature rather than strictly of the methodological or technical kind to which the survey was primarily directed, but they are too closely interrelated to be ignored. As will readily be judged from the examples given, the degree of urgency which a problem may assume locally or nationally depends upon many variable factors. Broadly speaking, the problems judged to be the most serious internationally are those on which most research is already being done. Some of these are described in the next chapter.

4. CURRENT RESEARCH AND DEVELOPMENT

In a number of countries, the application of computers to archival finding aids has triggered a great deal of research and development aimed at solving some of the larger problems of technology and methodology associated with this new means of handling archival information.

Much of this research has been widely covered in the professional and technical journals including ADPA, the journal of the ICA's Committee on Automation, and the Archival Informatics Newsletter edited by David Bearman (USA) both of which deserve to be brought to wider attention.

The technology is developing very rapidly, however, and in some countries so are archivists' responses to it. It is becoming unsafe to place too much credence even in articles which were written only a few years ago, since many of the problems and developments which they describe have already been overtaken by events.

This report could not attempt to provide a summary of all research completed or in progress. The more limited purpose of this chapter is to highlight three of the principal areas which, to judge from returns to the questionnaire, are of greatest current concern to archivists:

(1) The formulation of nationally and internationally agreed standards covering archival description including the control of terminology and authorities used in the validation of archival information.

(2) The means of communicating automated archival information nationally and internationally, through the development of data exchange formats and networks.

(3) The development of new technology such as optical disks and multi-media presentations.

Standards for archival description in general

[Note: throughout this section, in conformity with much current literature on the subject, the term 'standards' is used in a generic sense, to cover all kinds of rules, conventions and guidelines. Official Standards, properly so-called, promulgated by national or international Standards organisations, are denoted, as in this sentence, by the use of upper case.]

Unesco expert consultations

In October 1988 under the auspices of Unesco and ICA, a meeting of experts was convened at the National Archives of Canada to discuss current trends in description standards. A number of weighty general issues were addressed including the need for any kind of standards in this field; the extent to which archivists could follow or adapt mainly bibliographical and documentation standards from the related information professions; the roles of the International Standards Organisation and of the International Council on Archives.

Detailed attention was paid to the structure, content and interpretation (value) of archival information; to the various 'levels' at which archives may be described and the depths of description and elements of data appropriate to each level; to the need to establish (and enforce) authorities, for example for the control of terminology and subject headings and for the verification of such descriptive elements as the names of persons, places and organisations, the functions of the archive-creating entities and the forms of material.

Papers were presented outlining current concerns and research in the participating countries, with particular reference to developments in Canada, the United Kingdom and the United States of America. A report of the meeting's resolutions was published in the ICA Bulletin of December 1988, pp.71-72. Among these was a recommendation that ICA should establish a working group to develop international standards for the description of archives.

As a first step towards this, a planning meeting was called by Unesco and ICA in Paris in December 1989. This commissioned work on a Statement of Principles for archival description, approved the establishment of a working group by ICA and set as initial objectives of the group the discussion and agreement of the Statement of

Principles, the preparation of general rules for archival description and then more detailed discussion of a standard for description of the highest level of archival entity (fonds etc). It is foreseen that the group's work will include the identification of data elements and the compilation of a glossary of terminology. A commentary was also commissioned on three current or forthcoming publications about which more will be said below: the second edition of Steven Hensen's Archives, personal papers and manuscripts (Society of American Archivists 1989), the first three chapters of the Canadian Rules of archival description (forthcoming) and, from the United Kingdom, the second edition of the Manual of archival description ('MAD2') edited by Michael Cook and Margaret Procter (1990).

As the work proceeds, full consultations with the appropriate regions, sections and committees of ICA are envisaged.

Standards actually in place

Unesco requested that the present survey should take full account of these discussions. A general survey of standards relating to archives, few of which however are directly relevant here, was published in an earlier study in this series (Roper 1986; see also Rhoads 1982).

In order to discover the actual situation in the field, respondents to the questionnaire were invited to list any standards applicable in their countries to (a) the cataloguing or description of archives in general, (b) the control of vocabulary and terminology in such description and (c) the exchange of data about archives.

In many cases little or no thought has yet been given to these matters and archival description remains overwhelmingly a matter for local practice, informed by basic manuals on archive administration, guidelines issued by archive training schools, or general works such as ICA's Dictionary of archival terminology (Walne 1988). Some developing countries are explicitly awaiting a lead from the developed world or from the international community.

Despite the continuing work of the International Standards Organisation (Rhoads 1982; Thacker 1988), there are as yet no widely accepted international norms specially applicable to archival description. Respondents made little reference to the existing ISO documentation and

bibliographical standards.

In those countries where determined efforts have been made to agree national norms, the degree of their authority varies from Standards promulgated by the national Standards institution and rules enshrined in national archive legislation, through rules or recommendations of the central direction of archives (where such a body exists) or of individual archives, to recommendations, guidelines and advice promulgated by learned or professional bodies.

> In the United States a working group on archival description standards has recently drafted a definition of archival description as well as a useful matrix, shortly to be published in a special issue of the American Archivist, by means of which it will be possible to categorise any existing standards according to whether they are technical Standards, conventions (rules), or for guidance only, whether they are in origin internal or external to the archive profession, and whether they concern data value (the terms or elements used, authority files, etc), data contents (cataloguing rules and guidelines), data structures (formats) or information systems.

Whatever their status, the greatest problem everywhere seems likely to lie in their enforcement.

For archival description in general only China, Norway and the Soviet Union among those responding to the questionnaire reported specific national Standards. In Sweden some control is exercised through the national archive legislation. In a number of European countries including France, Italy, Norway and Sweden the national archives promulgates rules or suggestions for the arrangement and description of archives. Portugal is proposing the adoption throughout the country of a scheme of description based on the Manual of archival description (see p.45).

In countries where there is no central direction of archives, such as the USA and the UK, it is the professional bodies and individual archivists who have mainly been responsible for promoting such norms or guidelines as might apply. In the USA the strength of ready-made rules for librarians, notably the Anglo-American cataloguing rules 2nd edition, has been too great to ignore, and a number of state and university libraries in particular apply these rules to the description of their archival and manuscript holdings.

The Public Record Office (UK) notes that its map catalogue 'takes account of' AACR2. On the whole, however, these Rules have been found unsuitable for archive and manuscript applications, and both in the USA and Canada they have been or are being revised and amplified for application to archives.

Canada: towards descriptive standards

Working towards a national computer network for archives, Canada's archivists have first moved deliberately through a step-by-step analysis of the techniques of archival description.

This work entered a new phase with the creation of the Canadian Council on Archives in 1985 and the appointment of the first salaried Description Standards Project Officer. From the publication of Les instruments de recherche (Association des Archivistes du Québec 1984) and Towards descriptive standards (Bureau of Canadian Archivists 1985), work has advanced along several parallel fronts. Archival requirements are being written into CANMARC and a database of accessions has been prepared for the National Archives' Historical Resources Branch using a MARC format on CDS/ISIS software. Detailed work on authority controls, description standards and subject indexing continues. The first Rules of archival description are expected in 1990, substantially reworking the Anglo-American cataloguing rules, which have also been superseded in the United States by Steven Hensen's Archives, personal papers and manuscripts (2nd edition 1989).

United Kingdom: the Manual of archival description

Well before computerisation had had any real effect on archives in the United Kingdom there had been a good deal of serious debate about both archival terminology and subject thesauri. Working parties of the Society of Archivists devised a list of archival data elements (Vyse 1982-3) and also a prototype subject thesaurus (which, however, has not been widely used).

With funding from the British Library Research and Development Department the Society commissioned an Archival Description Project from the University of Liverpool under the supervision of Michael Cook. This surveyed the main computer applications in Britain's archives (Bartle and Cook 1983) and was subsequently

extended to an analysis of the levels and details of archival description, which again drew widely on the experience of all kinds of archives throughout the country (Procter 1988).

The first result was a prototype Manual of archival description ('MAD1' 'Cook and Grant 1985) which has now been tested and refined in a second edition, passing through the press at the time of this report. It has been warmly received by the profession in the United Kingdom where, however, there is no machinery for its enforcement or adoption as a nationwide standard, although it seems likely to serve in this capacity on an informal basis.

Control of terminology and concepts

Terminology

Control of vocabulary and terminology is the subject of growing professional interest. Where this is partly or mainly a matter of linguistic control lexicons and dictionaries have been published, such as the Lexicon van Nederlanse Archieftermen (The Hague 1983) used by the Netherlands and Indonesia. In Sweden an archive vocabulary is published as a national standard [62 80 10] and in China a Standard was recently published [1989] by the Scientific and Technical Research Institute on Archives. Hungary noted the existence of a national lexicon of archival terms and also an adaptation for Hungarian use of a dictionary of archival terminology used in socialist countries. France has published a vocabulary of archival and diplomatic terms. Work is in progress towards an agreed terminology for the Spanish and Portuguese speaking countries. Italy felt the need for some similar initiative. In Switzerland each originating department has its own vocabulary, or Registraturplan.

Thesauri

The ISO has issued guidelines for the establishment of monolingual (ISO 2788) and multi-lingual (ISO 5964) thesauri, but these appear to have been little used by archivists.

Further attempts have been made at national level to control terminology, in thesauri promulgated by national Standards institutions, by ministerial directions, or by the national archives or learned bodies.

In the USA, for example, the national Standard [Z.39.19-1980] on subject thesauri is informed by ISO 2788. A national thesaurus for information retrieval was issued as a national Standard by the USSR in 1980. The Direction des Archives de France has devised a thesaurus (W) governing the description and indexing of contemporary local administrative archives, for use by the archives of départements, whilst other localities have devised their own thesauri.

Work on thesaurus construction and subject indexing is in progress at national level in a number of other countries including Canada, China, Sweden, and under the impact of computerisation in many individual archives elsewhere.

Debates about the technicalities of subject indexing and the compilation of thesauri had been current throughout the archival world long before the advent of computers, and the present survey cannot enter into all the issues involved. As with archival description more generally, however, computerisation has served to sharpen the debate, and has opened up new practical problems and difficulties, as well as presenting opportunities.

Once again it is useful to remember that the needs of different countries, and of different kinds of archives within one country, may be quite distinct. It can be altogether more feasible for a local or specialist archives or even a national library to create a central subject index from its finding aids for archives and manuscripts, even down to item level, than for a large national archives faced with a vastly greater bulk of material to do the same.

Commonly in the latter kind of institution users still have to be instructed in the principles of provenance and the organisational framework of the record-creating bodies if they are to derive the greatest benefit from their searches. This helps to explain the recent crop of guides to national archives based on organisational histories (see above, p.11) and also the urgency of the need felt in some countries to establish authority controls relating to the organisation and functions of government as well as to the more obvious fields of personal, place and corporate names.

But it is perhaps over subject headings that most interest is now being expressed. In the USA the Library of

Congress Subject Headings file has become a de facto national Standard. This can have drawbacks as well as advantages. The assignment of appropriate subject headings to the reports received for the National Union Catalog of Manuscript Collections, for example, is a factor in NUCMC's considerable backlog of entries for publication. (In the United Kingdom an earlier initiative, in a pre-computer age, to introduce subject cataloguing of a comparable kind into the National Register of Archives was abandoned because of the staff costs involved and the unwieldy growth of the index).

Subject access to data can be greatly facilitated by computerisation, and is virtually expected by many software packages, some of which come complete with their own built-in thesauri. With the computer, for relatively little extra effort (keying in a few control words at the moment of description, for example) whole new tracts of information can be opened up. But at the same time some discipline needs to be introduced into the process, otherwise terms may be used inconsistently and not be recognised by the machine, or for that matter by the user, conducting the search.

Some archives and archivists have traditionally been opposed to the creation of general thesauri, for a variety of reasons including the feeling that every distinct fonds has its own character which should be allowed to dictate the terminology used (ADPA 1/1, 1972). Others argue that concepts and terminology in natural language vary so much even from region to region (Playoust 1988, pp.115-117), let alone from nation to nation, that observance of any central rules would be misleading.

Partly for this reason the French application for the control of modern records, PRIAM 3, has been built up using natural language, with controls inserted only at a later stage.

By contrast, with some modest variations, archives as far afield as Hungary and Zimbabwe appear to be able to make use of the Library of Congress Subject Headings.

Other countries have their own national authorities, like the Répertoire des vedettes-matières, Canadian Subject Headings and Canadiana Authorities used by the National Archives of Canada.

Authorities used with reference to the names of persons, places and companies are almost always of local or national scope, as in the specific instances

reported to the survey from Sweden and the United Kingdom.

There are further complications for highly specialised research centres where the archives may need a detailed command over concepts, or even place-names, required almost nowhere else and which are not covered in sufficient depth in any common authority.

The British Antarctic Survey, to take just one example, needs to identify very specific sites within a defined geographical territory as well as highly specialised scientific terms.

In the United States, the further research has progressed on the fundamentals of archival description, the more options it has been found necessary to create for the description and control of specific media or concepts.

A recent review of the position (Zinkham 1989) described the thesauri and controls already evolved or in progress: for art and architectural, cartographic, graphic and moving image materials, for form terms in general and for genre terms, binding terms, printing and publishing evidence and provenance, emphasising the need for careful analysis by form of material.

It is apparent to the outside observer that the main archival institutions, however much they wish to abide by standards or prescribed authorities, in practice tend to diverge in at least some respects to meet their own needs. One possible solution seems to be a loose federation of authorities where the minimum, and perhaps the only, requirement for the compiler of an archival description will be to give a clear indication which particular conventions etc are being followed.

With the free-text searches now possible on many databases, which are capable of producing word-by-word concordances of their data content, some argue that controlled subject indexing is no longer necessary. This depends largely on the scale of the individual application, but the use of some form of thesaurus-like control can be recommended as a means of taming the material for the searcher and reducing the time taken in searches. The many other forms of controlling searches, including the use of 'stop' and 'pass' or 'go' lists, word linkage, right and left truncation of key-words, and Boolean operators, and specific problems associated with marking up existing finding aids to assist such data control have been described elsewhere (Arad 1981 (2),

1987; Cloulas 1985).

In the particular fields of subject indexing and thesaurus control the current priorities would still seem to be at local and national rather than international level, although there is scope for the wider exchange of ideas and approaches to problems such as authority control. The professional associations of archivists probably have the most important role to play in this respect nationally, but some of the problems are far-reaching and require detailed consideration by specialists, for which public sponsorship and grant aid seem likely to be necessary.

Data exchange formats

Incompatibilities between one manufacturer's hardware and software and another's, and even between different ranges or issues of the same manufacturer's products, have been among the greatest stumbling-blocks to the free exchange of information between computers either by direct telephone or cable links on the one hand or by tape and disk on the other.

> The confusing array of national and international standards for electronic data exchange has recently been studied by the National Institute of Standards and Technology on behalf of the United States National Archives. The model known as Open Systems Interconnection has already been adopted as a national Standard by the USA and a number of other countries (Dollar 1990; United Nations 1990), and in this field archivists are joining with documentalists and other information scientists in a number of individual countries and through the International Standards Organisation in an attempt to bring some order out of chaos.

Until manufacturers have been persuaded to adopt industry-wide standards, however, other partial ways around some of the problems are having to be found, including notably a series of exchange formats for bibliographical and archival data which are not system-dependent.

ISO 2709 which governs the exchange of bibliographical information on magnetic tape has influenced the development of a number of national Standards in this field and the MARC family of formats, including USMARC:amc, were developed in conformity with it (Thacker 1988).

Librarians discovered relatively early that the worst inconveniences of system-dependency could be overcome by setting out the data in a particular format, tagged in such a way that the corresponding entries from differing inputs would be 'recognisable'. The rapid adoption of the MARC format greatly facilitated common cataloguing practices.

The Cartographical and Architectural Archives Division of the National Archives of Canada uses CANMARC for its cataloguing. The British Library, by treating its archives and manuscripts as quasi-book materials, uses UKMARC for the description of its Additional Manuscripts without an AMC format (See p.19).

USMARC:amc

The obvious advantages of an agreed format in the library world led archivists in the USA to seek a similar option for archives. Their research, which has been widely publicised, led to the compilation of a dictionary of data elements used in archival description, the evolution of an adaptation of MARC for the control of archives and manuscripts (USMARC:amc), its adoption at first experimentally but then definitively by a number of the major research libraries and networks including OCLC and RLIN (see below), and its adaptation for use with microcomputers.

By the mid 1980s some of the more enthusiastic advocates of USMARC:amc were challenging sceptics to 'demonstrate an archival requirement that the MARC format cannot accommodate' (Lytle 1984, p.361) and proclaiming that it had 'the potential to change the lives of archivists forever' (Hensen 1986, p.32). It may therefore be appropriate to look in turn at some of the arguments for and against this format.

MARC:amc has now been so widely tested in the United States that it is becoming in effect a national standard. Experiments with the format have been successful in Canada, and its development in the United Kingdom and Sweden is being actively explored. It has been widely promoted by its advocates. Its adoption by RLIN has facilitated its wide use in the USA throughout government, university and state repositories, with all the advantages associated with networking (see p.49). It has enabled repositories to exchange and cumulate data without machine dependency, and may have advanced the credibility of the archival profession in the eyes of other

information professionals particularly librarians.

Unlike its parent MARC formats, AMC is not medium-specific but can be used to describe any kind of archives. It has the facility to cover description across the whole life-cycle of records through its Archives and Records Control (ARC) segment. Its adaptability to microcomputers is proving helpful for small institutions which at present have no network links: software for this purpose has been devised by Michigan State University (MicroMARC:amc) and commercially as Cactus's MINARET, although there has been some difference of opinion among reviewers as to the usefulness of these applications (Archival Informatics Newsletter 1/3 pp.46-48; 2/3 p.65).

The AMC format could equally be used in manual cataloguing in repositories which at present have no computer facilities but wish to keep open that option for the longer term. In the computerised environment for which it was designed, however, it enhances access to the data for all users by offering cross-referencing and cross-searching between fields and between data elements.

The overwhelming impression is that USMARC:amc is here to stay.

But it has its critics, even in the United States, and it remains to be seen how successfully it could be adopted overseas. For all its virtues it has still a basically bibliographical pedigree that some regard as an unnecessary constraint for archives, including the separation of main, added and subject-added headings, which breaks up the description. It is designed with collection/fonds-level descriptions in mind, and although it can be used at lower levels most users continue with separate word processing applications for the production of their inventories below series level. So in this sense MARC:amc cannot be seen as a complete archival description system in the way that its parent MARC may be a complete library cataloguing system.

MARC:amc has also been criticised for its complexity compared with traditional archival description practices, and for the number of fields and sub-fields provided, not all of which need be filled in but whose very existence may encourage prolixity in description and too much attention to detail when time is at a premium. This may make it a costly choice, and particularly unsuitable for handling data in the quantities required by very large national or provincial archives. Warnings have also been sounded about other costs, open and hidden, of adopting

the format: the initial costs of computerisation, staff costs including training in the use of the format, on-costs caused by the need to conform to authorities demanded in a network application of AMC, which might in turn require standardising earlier data and supplying, for the benefit of the computer, data that had been taken as read or felt unnecessary in a manual environment.

Other formats

Other countries may prefer to devise their own formats, to take account of their differing traditions of archival description, and a number including Sweden, Norway and Portugal are already doing so.

In Sweden, the automation of the National Catalogue for Private Archives has provided the incentive for developing a common exchange format. The national archives analysed the existing manual data forms for the Catalogue, compiled over a 20-year period, and devised programs to cater for the elements of description already employed and a number of additional ones. Efforts are now under way to devise a Swedish MARC:amc format to cover collection-level description with a view to national or international data exchange with other archives and libraries. There remain some substantial areas for research, particularly on authorities and on the means of incorporating the distinctive Swedish classification scheme which prescribes nine main categories of papers for each record-creating entity, each of which may according to the circumstances be further sub-divided. It is intended that the database devised in this way to cover private papers should gradually be developed to cover government and municipal records (Dahlin 1988).

Norway has similarly developed, using the programming language PASCAL, a standard description format that is not machine-dependent, combining a hierarchical database structure with free text retrieval at the levels of the originating institution, series and item, for use in the national and regional archives.

The Portuguese Institute of Archives is working towards the establishment of a national archives network. It has used Unesco's MicroISIS software (with MSDOS operating system) to develop a hierarchical system of archival description closely based on the British Manual of archival description (see p.37). The system, ARQBASE, aims to improve precision and standardisation

throughout Portuguese archives. It was described to ICA's Automation Committee at its meeting in London, November 1989.

ARQBASE provides a different field for each level of archival description, with sub-fields appropriate to each level in accordance with MAD. It allows free text input and selected retrieval at all levels. Information once entered at a higher level is automatically carried forward to lower-level description of the same material. MicroISIS has been found to meet all its needs for on-line retrieval and to provide suitable printed finding aids for public use.

Concurrently with the later stages of the Archival Description Project (see p.37) Liverpool University has also been studying the ways in which USMARC:amc might be adapted for the UKMARC environment, and in 1989 issued a draft discussion document for a UKMARC:amc. The feasibility of such an application cannot be doubted but a great deal of ground remains to be covered before this can be put into practice, with resistance being shown initially by UKMARC's controlling body, and discussions barely yet beginning among archivists, manuscripts librarians and archival insitutions about authority controls at national level. More seriously, the major national archival institutions have yet to be persuaded of the need to comply with what are still seen as bibliographical constraints.

The initially different responses of archivists in Canada and the USA to the challenge of computerisation - the one looking at fundamentals of archival description, the other at a data exchange format - are now to some extent converging, though considerable further research and development are required.

There are some interesting parallels between the experiences in these two countries and also in the United Kingdom. Interest was awakened at about the same time, in the late 1970s and early 1980s. The professional associations took up the cause but soon proved to have insufficient resources to make the required progress. The initiative passed to small ad hoc working parties or groups of individual archivists, sometimes acting without any formal mandate. Funding in each case had to come from public and private sources, but notably in the USA from

the National Endowment for the Humanities and the National Historical Publications and Records Commission, in Canada from the Social Sciences and Humanities Research Council, and in the UK from the British Library Research and Development Department. More recently, strenuous efforts have been made, most successfully in Canada, to enlist the support of the national archives and in the USA to put the ball firmly back in the court of the professional associations. Only with commitment and promotion at this higher level does further real progress now seem likely.

Networks

A simple computer 'network' can be created locally by linking together computers or computer terminals within a single institution. This is already common in archives and requires no special comment here.

A further stage is the setting up of direct links with a limited number of other users, for example in branch repositories, government departments or research centres.

> The 8 offices of Australian Archives, for example, together with the Australian War Memorial, are linked. So also are the Presidential Libraries in the United States.
>
> The PRIAM 3 application at Fontainebleau, France (see p.9) is linked to other offices of the Archives Nationales and to archivists based in government ministries. The Archives Nationales and the Direction des Archives are also linked by means of the LYNX telecommunications network to some sixty local archives.
>
> In Switzerland, the first steps have been taken towards keying in data for the national archives at its point of origin in government ministries, a facility which, although under consideration, is not yet available in the United States or the United Kingdom.
>
> The National Archives of Canada draws some of its computer power from a government administration computer, and the Archives Nationales du Québec is linked (although at present only for off-line editing) to its provincial offices (MacDermaid 1990).
>
> One of the databases of the Italian national archives is linked to the Italian Supreme Court.

Beyond this are still wider applications extending to networks with national and even international coverage. These are already well established in fields other than archives, but on the whole archives have been slow to take the initiative in creating networks. Generally speaking it is the universities and learned institutions acting on behalf of their researchers that have been keenest to obtain wide access to up-to-date information in their special fields, and have led the way in sponsoring computer networks for this purpose. Direct sponsorship of networks by national archives is still a rarity. Networking in any case may not be the only, or the best, means of pooling data for every country.

National networks come in a number of different configurations. It is unnecessary here to describe more than two types by way of example:

- where a single 'host' computer accepts data files from a number of participating institutions, the files being so stored that they may be searched either separately, institution by institution, or cumulatively, by certain fields or prescribed terms. (See below, RLIN).

- where there is no central database but the computers of each participant are linked by telecommunications in such a way that the network may be used to 'call up' the contents of any one of their databases, which may then be searched individually according to the rules appertaining to that database. (See below, JANET).

In response to the questionnaire, very few national archives reported direct involvement in such networking.

Exceptions include the US National Archives which is now participating in RLIN, the Canadian National Archives which contributes data on picture conservation to the International Conservation Information Network, and the national archives of Hungary one of whose databases is made publicly available through the national public education information network. In the United Kingdom both the Public Record Office and the National Register of Archives are in the early stages of exploring possible participation in networks, and experiments are beginning in the Soviet Union.

But it would be profoundly unsafe to base any appraisal of networking and the present extent of its coverage on the experiences of the national archives alone, when for reasons indicated above it is the academic institutions

which have often taken the lead.

In the early phase of computerisation in the USA there was a yearning in some quarters for the creation of a centralised national information system, perhaps based on one computer network which would contain (at least in summary form) information about the holdings of every repository throughout the country. The 'great database in the sky' was soon seen to be a chimera, given the enormous quantities of data that would be involved, the great variety of institutions to be covered, each with its own particular needs from any such system, and the complexity of some of the issues to be addressed. What has emerged in its place is a more federalist approach in which any national information system will be a partnership of several, perhaps many, sub-systems. There is an interesting parallel here with early aspirations to centralised description standards contained within one code of practice, which are being diluted in favour of a federalist approach which recognises, for example, the varying specific requirements for the description of different archival media, and the local needs of local repositories, while still seeking to reduce or contain diversity of practice and keep the separate parts of the system linked.

National networks have both advocates and detractors. The issues can only be resolved nationally by detailed discussion between the major archival institutions and the professional associations of archivists, and perhaps with representatives of user organisations. In part the outcome must hinge on the successful identification of the users and their requirements (see p.28). In part it will depend on the archivist's vision of 'information' and of current or future opportunities for its dissemination and use. Overwhelmingly, however, it will continue to be governed by practicalities such as the availability of financial and manpower resources.

Among the advantages canvassed for national computer networks in archives are the following:

Wider dissemination of information about the archival holdings of individual repositories, as a supplement to or substitute for traditional means of dissemination through publications and finding aids. This may be combined with the ability to output information in new ways such as subject guides.

The possibility of merging or comparing information from several, or many, different archives. Apart from

the obvious benefits to searchers, this may bring practical opportunities for archivists to compare and perhaps improve records management practices and standards of archival description.

The further possibility of merging or comparing archival information, irrespective of medium, with bibliographical information, and combining this facility with selective subject indexing to increase the points of access for the benefit of researchers as well as archivists.

Some potential problems, mainly associated with the first type of networking, need to be investigated more closely in relation to particular requirements and particular networks. They include:

Cost. The need to become a subscriber to the network, which may involve not only direct costs of membership and of data capture but also the need to conform to the network's requirements as to data standards. For small archives in particular, the cost of introducing new standards might be prohibitive in relation to any likely benefits from use of the system. And there is little incentive to contribute data, with a charge for input, if the contributor will not otherwise use the network.

Possible problems of over-centralisation, leaving participants at the mercy of the host organisation and dependent upon its continued commitment. There may be inconvenient periods when the entire system is shut down for maintenance, or 'crashes'.

Lack of 'policing'. Where the host organisation is not in a position to control or standardise the quality of the input data, or to verify or maintain it, there may be unevenness of approach among participants and possibly confusion over fundamentals such as the desired levels of description or depth of detail to be given.

Possible loss of control over the data and its onward use by other users of the network.

The Research Libraries Information Network (RLIN)

[This section is substantially based on information kindly supplied by Anne Van Camp, archivist of the Hoover Institution, including issue 18 of the Research Libraries Group Newsletter (Winter 1989), an RLG press release of 16 March 1990, 'Vatican archives records to be accessible through RLIN', and a number of information leaflets on RLG and RLIN. Further information is obtainable from the RLIN Information Center, The Research Libraries Group Inc, 1200 Villa Street, Mountain View, CA 94041-1100 USA. For additional information and assistance the author is indebted to Nancy Sahli, David Sutton and Lisa Weber. (See also Reed 1985; Wallach 1990)].

The exchange of bibliographical information among national and academic libraries had already become commonplace well before any similar process was considered in respect of archives and manuscripts (Weber 1988).

In North America a number of national and international networks had been established with this primary purpose, including the Online Computer Library Center (OCLC), the Research Libraries Information Network (RLIN), the University of Toronto Library Automation System (UTLAS) and the Washington Library Network (WLN). The advantages of exchanging cataloguing data, to achieve standardisation and reduce toil where the ground had been ploughed already, needed no further justification.

In 1983 Yale, Cornell and Stanford universities, members of the non-profit-making Research Libraries Group (RLG) that hosted RLIN, obtained a grant from the US Office of Education to enable them to undertake a pilot project entering data in the newly devised AMC format into RLIN. The network has never looked back. Many other libraries and archives have followed suit, and although other networks, especially OCLC, have taken the same path, at the time of writing RLIN, based at Palo Alto, California (Stanford University), has established a commanding lead in this field with about 250,000 records, generally but not exclusively at collection or series level, for the holdings of 90 institutions.

Established initially to serve the bibliographical needs of members of RLG, covering many of the larger academic and special libraries, RLIN through its adoption of AMC has enabled archivists not only to record their holdings for wider benefit but also, if they choose, to manage them using the archive and record control segment of AMC. The Hoover Institution, for example, has now recorded all its

series by this means and uses the ARC segment to manage its holdings. It is also able to produce some 180 up-to-date subject guides on demand from information in the database. Other users too have commented on the redundancy of, for example, manuscript accession registers and registers of depositors in the wake of automation.

AMC has enabled RLIN to take on board data not only from the members of RLG, but, for example, from two successive projects on selected state records, sponsored by the National Historical Publications and Records Commission (the Seven States Project completed in 1988 and, more recently, the Government Records Project). RLIN also provides on-line access to the name and subject-heading authority files of the Library of Congress, whose use is encouraged throughout the network. In 1988 the National Union Catalog of Manuscript Collections began to supply current data for inclusion in RLIN.

In the same year the US National Archives became a member of RLG. Its published evaluation of a pilot project using RLIN to test the Archives and Records Control segment of MARC:amc (Holmes 1986) remarked on the value of RLIN as a potential means for the National Archives to exchange information with other federal institutions, other archive repositories and national bibliographical databases, and for achieving wide general circulation at less cost than by traditional methods for information from the National Archives. Although, owing to the complexity of its own management requirements and its huge volume of archives, the National Archives felt it impractical to use the ARC facility, the state archive repositories and other participants have claimed substantial benefits including the ability to compare and standardise records management and archival description practices.

RLIN has the facility not only to establish on-line connections with mainframe computers elsewhere, but to accept data on tape from mini- and microcomputers, provided that it conforms to the MARC formats. This is currently opening the way for the importation of data from a number of sources outside the USA.

> Discussion is under way towards the inclusion of the existing database of the Location Register of English Literary Manuscripts [Reading University, UK], and developments concerning archives in the Far East are likely, owing to RLIN's facility to handle Chinese, Japanese and Korean characters.

One of the members of RLG, the Bentley Historical Library of the University of Michigan, obtained funding support from the National Endowment for the Humanities, the Getty Grant Program and the American Friends of the Vatican Library, to send two staff members to Rome in September 1989 to gather series-level information about the Vatican Archives and those of the Propaganda Fide, together with additional information about other archives relating to the Papacy and St Peter's. Using a microcomputer equipped with the MicroMARC:amc software developed by the university, they have entered data from the Vatican's disparate existing finding aids, returning the disks to the university for eventual loading into RLIN. As well as providing a unified database approach to these internationally important archives the project, scheduled for completion in 1992, has demonstrated the great advantage of combining private with public funding and of seeking international cooperation among archivists. (RLG press release 1990).

Reviewing the first five years of MARC:amc in RLIN, one of its key officers noted that 'It has increased inter-institutional access to a very broad spectrum of primary source material nationally. It has provided an invaluable forum for cooperative activities among archivists and special collections people. And it has proved conclusively that you can integrate information about archival records and manuscripts into a bibliographic database'.

RLIN is accessible to individuals as well as institutions upon payment of a subscription. It can be accessed via a modem link through the GTE/Telenet communications network for a charge.

The Joint Academic Network (JANET)

An example of the second kind of network is the Joint Academic Network (JANET) serving mainly universities and polytechnics in the United Kingdom. Participants can make available any computerised databases under their control for the scrutiny of subscribers to JANET and can impose their own conditions of access and charges.

The format in which data is presented is left entirely to each participating organisation. It is not necessary to use specified hardware or software, and the only requirements for extracting data are a modem link, the network's telephone number and a computer terminal

equipped to receive and interrogate the data. The last point has caused some initial difficulties to users with incompatible terminals but this problem is easily resolved.

At present, in comparison with a network like RLIN, there are few archival databases available on the system, which mainly concerns the sciences and social sciences. But the number is steadily rising. Among them is the Wellington papers project, in progress at the University of Southampton, where the database contains not just series or item level descriptions of the first Duke of Wellington's papers held by the University Library, but extensive transcripts, insofar as they have been edited. The system at Southampton uses STATUS software which allows complete free text interrogation if required.

International networks?

Archivists, unlike librarians, have not yet established any fully international networks, although a number of examples cited above (eg pp.8,23) demonstrate that national boundaries need be no obstacle to collaboration and to the exchange of data, and that networks of primarily national scope such as RLIN may have the capacity to take in data from other countries, and accept foreign subscribers.

In its response to the questionnaire Switzerland, alone among all the respondents, looked to the future creation of a network to link national archives. As more and more archival data is automated and databases held by individual institutions become more comprehensive and more representative of their total holdings, it is difficult not to see the demand for international networking increasing, both among archivists and perhaps more particularly among scholars using the archives for their research.

New Technology

Some of the more recent developments in computer technology, and the effects which they may soon have upon the storage and retrieval of archival information, have been reviewed in the professional literature (Dollar 1986, 1990; Bearman, Optical media). Others, such as the application of artificial intelligence in expert systems, mentioned by Switzerland and the USA, offer scope for further exploration in future.

Image-processing systems

Optical and video disk applications, already widely established in business, are gaining a strong (if still experimental) foothold, both as archival media in their own right and, linked to computer databases, as a means of retrieving information from archives. They are being used respectively to store images of original paper documents, electronic data converted to this medium from a number of different computer applications (UK), and sound recordings (Soviet Union).

> In a special venture to commemorate the quincentenary of Columbus's first voyage to the Americas, the Spanish ministry of culture with sponsorship from IBM (Spain) and the Fundación Ramón Areces has embarked on a project to scan, and capture on optical disk, initially some 9 million pages of text and all the maps of the Archive of the Indies, Seville, at an estimated cost of one billion pesetas, and requiring a storage capacity of around 5 gigabytes (Spain 1989).
>
> The system will in addition absorb and assimilate by means of a relational database of 600 megabyte capacity, all the existing finding aids to the Archives, in printed, typescript or manuscript form. Access points will include provenance, repository call number, and document description, controlled by means of a specially constructed subject thesaurus based on terms and concepts intrinsic to the material.
>
> Some logistical problems seem likely to arise in handling the many optical disks which will be generated by the project, but its results will be eagerly awaited by the archival world. The objectives of the project are to facilitate the wider dissemination elsewhere in Spain of information about the archives by providing copies of the disks or print-outs of documents as required, and to reduce wear and tear on the originals since they will normally be consulted from the optical disks at high resolution screens.

Although operations on this scale cannot readily be contemplated by most archives, a number of other archives, both national and local, reported using or being about to use similar technology.

> The National Archives of Canada's ArchiVISTA system holds on optical disk the archives of the Canadian Centre for Caricature, some 20,000 cartoons whose scanning as a pilot project took 7 months. In digital

form, however, these already occupy 30 optical disks. For practical viewing, video disks will be used for economy of storage. As in Spain, the data content as well as the images are processed by the same integrated system. Optical disks are also now being used in Canada for the storage of data from magnetic tapes.

In the USA an experimental optical disk system (ODISS) at the National Archives has been successfully tested on the military service records of Tennessee units that had served in the Confederate army in the Civil War (Dollar 1990). The equipment is capable of scanning not only the written or printed word but also images on microfilm, microfiche or aperture card.

The City Archives of Utrecht, Netherlands, has developed with WANG The Netherlands BV an archive information system ARIS for use on microcomputers, initially for the construction of a database of notarial records, linked to a Wang Integrated Image System containing the images of all items described in the database.

Similar developments or plans are reported in a number of other countries including Norway, Singapore and the United Kingdom.

Image processing systems offer a number of advantages including ease of distribution, the option to enhance the image of a faded or damaged original, the preservation of that original from wear and tear, the ready supply of copies and fast access to the data.

But apart from considerations of the initial capital cost, which are common to all such equipment, considerable difficulties of a practical as well as a technological nature may arise. A disk may be consulted by only one user at a time. One manufacturer's equipment is still normally incompatible with another's and today's 'reading' equipment may be replaced by a new series of machine in a few years, with the risk that disks may have to be copied or transcribed if they are to remain readable (Hedstrom 1988). Prototype erasable optical disks (in contrast to the conventional WORMs) have been announced by several manufacturers only to be withdrawn. For the moment this remains a field into which archivists should venture with some circumspection.

Multi-media systems

As the technology advances, a few national institutions are at the forefront of innovations, seeking new means of collating and presenting information for a public which, it seems, is increasingly image-dependent. This may result in the further weakening of some of the conceptual barriers hinted at elsewhere in this report, especially those between library and archival holdings on the one hand and between different archival media on the other.

> At the Library of Congress (USA) the first steps have been taken in a multi-media presentation, entitled American Memory, on which a six-year pilot project was scheduled to begin in 1990 after trials in 1989. This will link LOC holdings of manuscripts, sound recordings, books, motion-pictures and graphic and photographic materials thematically in series. A master catalogue on CD-ROM linked to a microcomputer will be the initial means of access to associated compact optical disks for digitally stored information and video disks for analogue signals.

CD-ROM

Little other mention was made of CD-ROM applications by respondents to the questionnaire, but some see this medium as an alternative to hard copy publications of texts and finding aids including databases, and some as an alternative to networking.

> The Genealogical Society of Utah, for example, now offers its International Genealogical Index and Ancestral File on CD-ROM. It identifies as some of the advantages for its own constituents' needs the ability to keep family research independent of a complex computer system and of networks, to avoid widespread inconvenience in the event of computer failure on-line, and to protect system access and important data.

5. CONCLUSIONS

This study has considered in turn the kinds of archival finding aid produced in a computerised environment; the perceived benefits and problems particularly associated with computerisation in this field, many of them methodological or technical in nature, but some more a question of management and resources; and thirdly the principal areas of concern, as represented in current research into such matters as standards for archival description, data exchange formats, the establishment of computer networks, and experiments with new computer technology including optical disks.

Computers have the potential to make us look afresh at the elements of information about archives and the ways in which these may be manipulated, merged and presented to users. The data need not be static, as it is in many finding aids of a more traditional kind, but may instead be dynamic, constantly kept up to date and cumulated with other data to allow more extensive, and better directed, searching. Databases, some already of prodigious size, are quite different in concept from finding aids of the pre-computer age.

Computers have facilitated the production of every kind of finding aid both for the management and physical control of the archives and for their intellectual control for access by readers. In turn, automation has encouraged the creation of summary guides to holdings of individual repositories and of inter-repository guides, and has enhanced the ability of archivists to explain provenance and authority in relation to each fonds, concepts which although central to archival description are still little understood by the mass of users.

The overwhelming impression from returns to the questionnaire is that computerisation has brought substantial, if still imperfectly measurable, benefits in this area, as well as a host of problems, which in some measure all computer users have experienced, but to which on the whole solutions have been found, or are being sought in current research.

Among the broadly 'methodological' problems, the agreeing of national and international standards for archival description may be singled out for special attention. Six countries replying to the questionnaire (Australia, Hungary, Italy, the Netherlands, the United Kingdom and the United States of America) included this

among their priorities for further development. Although such standardisation would be equally beneficial in manual systems, it has special relevance in this context as a means of facilitating the transfer of archival data from one computer to another, on which much else may depend.

Many of the 'technical' problems, on the other hand, (the choice of a suitable system, the means of communication between one computer and another, etc) appear to be characteristic of computerisation in general rather than specific to its application in the field of archival finding aids which was the primary concern of this report. If one problem particularly associated with finding aids stands out from the returns as causing continuing concern it is that of converting word-processed text into database structures, more particularly in larger archives where the volume of information already word-processed is substantial.

It is clear, however, that the problems demanding the most urgent attention differ from country to country and even from archives to archives according to the stage of computer applications and development that has been reached. The examples considered have ranged from those archives wondering how best to take the first tentative steps in computerisation to those that have already travelled so far and so fast that they now find it a time for serious stock-taking and longer-term strategic planning to make the best use of computer resources for the future.

The terms of reference for this study did not call for any recommendations. But some final reflections arising from the evidence collected during the survey seem appropriate in conclusion.

Those archivists just beginning their explorations of computerisation need to know how to avoid some of the problems encountered by their now more experienced colleagues. This means that the dissemination of news and views about archival computer applications will continue to be of paramount importance.

In some countries this is already being well provided-for at national level, through the professional associations, the professional and technical literature, and computer user groups.

Internationally, the ICA has promoted communication,

through its conferences and publications, and particularly by means of its Committee on Automation, which brings together experts for the exchange of information and ideas and publishes technical papers. ICA has also maintained valuable contacts with other international bodies representing the information professions, and with the International Standards Organisation.

Unesco for its part has assisted developing countries through expert consultancies and bilateral programmes during the formative phases of their computerisation. Its freely available CDS/ISIS software (see p.22) is being widely adopted. A number of its RAMP studies have dealt with aspects of archival automation. In view of the major costs of computerisation, financial and technical aid seems likely to be a continuing need.

By building on the existing partnership between individual archival institutions, the ICA and Unesco, it should be possible to go further in pooling experience on archival information for wider benefit, whether in publications, commissioned research or practical training.

1. There is a demand for guidelines on how to plan and implement computerisation for archives, on systems analysis and the preparation of operational requirements, and on how to assess and evaluate software applications and packages. Some guidance already exists at national level, but it could usefully be consolidated and brought up to date for international use.

2. One respondent to the questionnaire suggested that it would be helpful to distribute information about individual systems, to commission specific tests and reports, investigate particular problems, and ultimately to develop software for archival application. This proposal extends well beyond the specific areas of this report. ICA might wish to give it further consideration. A special study could, for example, be made of the application of CDS/ISIS for archives. Insofar as current trading practices permit, archives which have developed their own software applications or have found particular commercial packages to be useful could also be given an opportunity to draw these to wider attention. There might eventually be scope for a deliberate reduction in the number of different applications covering what are in many respects similar archival operations, and for

the selection and development of the best for wider dissemination.

3. Training, too, will continue to play an important part. Sometimes there is no alternative to self-help, from the available literature or by direct experience of the computer system, and some have in any case found this the best form of instruction. But workshops, for example in database applications, which have proved valuable at the national level, might be further extended to an international audience, whilst more specialised workshops might bring together those archivists and other experts working at the frontiers of our science, in areas such as artificial intelligence/expert systems, the development of standards for the communication of electronic records and the creation of networks. National and bilateral initiatives have already been taken in these areas. The effort may now need to be extended over a wider international front.

To return finally to standards for archival description, the essential groundwork has to be laid at national level or (experimentally for the time being) among neighbouring countries with similar archival traditions. Those countries with a common or closely related language or history might work together to address common problems, as some of the examples cited have already shown them to be doing in other fields. They should then be encouraged to share their experience more widely if appropriate.

Discussion of standards should involve the widest possible constituency, certainly of archivists but probably of other users also, in order to ensure that any resulting standards command the widest possible respect and following. There is no virtue in establishing purely hypothetical norms to which nobody will subscribe. The ICA's working party on descriptive standards (see p.34) will provide a focus for the wider exploration of these issues, in consultation with ICA's committees, sections and branches. It seems likely that a number of parallel consultations, on such matters as authority control, will be necessary as this work proceeds.

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Institutions

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BARBADOS: Department of Archives

CANADA: National Archives; Archives of Ontario

CHINA: State Archives Bureau

FRANCE: Direction des Archives; Centre des Archives Contemporaines, Fontainebleau

HUNGARY: Müvelödési Minisztérium, Levéltári Osztály

INDIA: National Archives

INDONESIA: Arsip Nasional

ITALY: Ufficio Centrale per i Beni Archivistici

MALAYSIA: National Archives

NETHERLANDS: Algemeen Rijksarchief; Utrecht: Gemeentearchief

NEW ZEALAND: National Archives

NORWAY: Riksarkivet

SINGAPORE: National Archives

SOVIET UNION: General Direction of Archives

SRI LANKA: National Archives

SWEDEN: Riksarkivet

SWITZERLAND: Bundesarchiv

UNITED KINGDOM: Public Record Office; British Library; Royal Commission on Historical Manuscripts (National

Register of Archives)

UNITED STATES OF AMERICA: National Archives; National Historical Publications and Records Commission; Library of Congress; New York State Archives; North Carolina Division of Archives and History; The Genealogical Society of Utah

YUGOSLAVIA: Arhivski center za strokovno tehnično vprašanja

ZIMBABWE: National Archives

[No reply to the questionnaire was received from Belgium, Brazil, Bulgaria, Federal Republic of Germany, Israel, Mexico, Portugal or Spain. Negative returns were received from Cyprus, the Seychelles and Trinidad.]

Individuals

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